phenomenon that is eminently worthy of an attempt at a general explanation. At the surface of the ground, on plateaus and lowlands, the wind is calm or comparatively light during the nighttime because the colder air near the surface does not partake of the movement that prevails overhead. But during the daytime, when the lower stratum is heated and rises, the upper stratum descends bringing with it its great horizontal velocity, and the direction of the wind, as well as its velocity at the surface, will depend upon the height from which the upper current comes down. Thus, if an east wind descends into calm air the result would be a lower east wind; if subsequently a south wind descends into the latter, it will become a southeast wind and if, afterwards, a west wind descends into the latter, it may become a southwest wind. A careful study of the cloud motions will, undoubtedly, help the observer to explain the diurnal veering ,or backing, of the surface wind as it progresses from hour to hour during the day.

ARKANSAS.

Mr. E. E. McCollum, voluntary observer at Moore, notes that "on the night of the 21st there was a heavy cloud in the northwest, with wind; the lightning played continuously and a body, like a large meteor, seemed to burst from the cloud and float slowly to the east until it passed out of sight."

This reads exactly like a case of ball lightning, for large meteors can scarcely be said to float slowly. Faulkner County is near the center of Arkansas, and if any one else north of Mr. McCollum was so fortunate as to have observed this bright ball it would be very interesting to determine its height and velocity by comparing the two records. In general, ball lightning has been sufficiently well observed to establish the fact of its existence, but no plausible explanation of its nature has yet been considered acceptable to physicists; every observed fact bearing upon it is of value.

COLORADO.

Mr. Brandenburg continues his monthly summary of snow in the mountains. In general, heavy precipitation characterized the entire month in the foot hills and plains, but this only extended westward into the mountainous region to a small extent, and practically none fell on the westward side of the Continental Divide.

At Canon City a severe hailstorm occurred on the 21st, lasting forty minutes. The hail belt was about 5 miles wide east and west, and in some portions the ground was covered to a depth of 8 inches.

INDIANA.

The observer near Portland, in Jay County, reports that on the evening of May 18 a heavy hailstorm prevailed at Fort Recovery near that city; hailstones over 10 inches in circumference, and weighing six ounces, were picked up; even iron roofs were punctured and much damage done. It would be a fair problem for an observer to determine by actual experiment what the speed of a falling hailstone must be in order to accomplish the destruction that he witnesses. Hail or ice can probably be fired from guns or cannons with a small charge of powder in such a way as to determine the velocity required to produce any given destruction. The statement as to the size of the biggest stones is not quite so important to the meteorologist as a statement of the average depth of the hailstones, or still better, the equivalent depth of the solid sheet of ice. The following rule, given on page 399 of the MONTHLY WEATHER REVIEW for September, 1897, refers to the case of spherical balls of ice, namely, the sphere of ice, when converted into a hexagonal cylinder that precisely incloses or circumscribes the sphere, will cover that hexagon to the depth of 0.6045 times the diameter of the sphere. In other words, a layer of continuous spheres of ice four inches in diameter is equivalent to a solid layer of ice 2.418 inches thick. But as the fall of hail comprises stones of every variety of diameter, the simplest method for the observer is to gather all the hail that falls on a small area, equal to say, five times the area of the mouth of his rain gauge, put it all into the gauge, and when melted measure and divide by 5 to get the equivalent rainfall, or in this case, the equivalent sheet of ice.

IOWA.

A newspaper paragraph, quoted from the Sioux City Journal, says that at Sabula, 3 miles north of the late destructive tornado of the 17th, when scarcely a breath of wind was stirring at the place, the iron roof of a large warehouse in town was lifted and thrown into the street at the same time that those near the building felt the air grow hot. We can easily understand that a sudden diminution of barometric pressure over Sabula would allow the air within a warehouse to expand and lift off the roof; this is a common occurrence in tornadic phenomena; but we do not quite understand why the air in the neighborhood of the building should grow hot at this moment, and hope that some observer will give us a more minute account of the whole series of phenomena.

MONTANA.

There is no doubt but that the enthusiasm of Mr. Eddy and Mr. Woglom of New York City in the matter of kite flying has been of the greatest possible service both to meteorologists who raise their apparatus by means of kites and to patriots who insist on raising the American flag as high as possible. Mr. James T. Woods, of White Sulphur Springs, Meagher County, in central Montana, in the valley of the South Fork of the Deep River, and about 40 miles east of Helena, gives a description of his use of the Hargrave kite for raising a large United States flag to a height of 1,400 or 1,500 feet, so that it could be distinctly seen from all the ranches within several miles. We beg to commend to Mr. Woods the importance of the work that he can do for meteorology by using his kites to determine the temperature and the winds and the heights of clouds for several thousand feet above his station, which is probably already 4,000 feet above the ocean. The good work done by Mr. Allen at Bayonne, N. J., as published in the April number of the MONTHLY WEATHER REVIEW, should serve as an incentive to many other enthusiastic kite flyers. Every station has its own local peculiarities as to diurnal and local winds, which can be best investigated by the help of the kite. The work of the voluntary observers in America ought to rival that done by their colleagues in Europe in the investigation of local peculiarities that must eventually prove to be of great interest for general meteorology.

NORTH CAROLINA.

An unusual number of stations report remarkable hail and hailstorms. The general distribution of hail is frequently such that the heaviest occurs only in the lowlands and flat countries, but in North Carolina the most destructive seems to have been midway between the lowlands and the mountains. It would be worth inquiring whether the statistics of the last twenty years show any law of this kind.

RECENT EARTHQUAKES.

Prof. E. W. Morley, of Adelbert College, Cleveland, Ohio, and Prof. C. F. Marvin, of the Weather Bureau, Washington, D. C., report no earthquake disturbances of their respective seismoscopes during the month of May. Other reports have been received as follows:

April 29.—Managua, Nicaragua. Concerning this earthquake, Mr. Chester Donaldson, United States Consul at Managua, reports as follows in a letter dated May 4:

Unusually severe earthquake at 10:45 a. m. Beginning very light it gradually increased for about forty seconds until everything was shaken in earnest, then it decreased in strength and passed away in about ten seconds more. Every house in the city was more or less damaged by plaster falling, the mud or adobe walls cracking and the loose tiles on the roofs shaking off. No well built house of lumber, stone, or brick suffered any considerable damage; but one badly constructed house with old mud walls and weak roof fell in.

In Leon and Chinandega the earthquake was much more severe, leaving several buildings in ruins and injuring a few people. In these countries they have a habit of building very loosely. Many houses are constructed of blocks of mud laid up without any mortar or cement of any kind to hold them together. They also lay the tiles on the roofs without any fastening whatever. These buildings were of course badly shaken up and all the tiles need relaying.

As far as I know there was not a single death caused by this phenomenon. Since its occurrence there have been two or three slight tremblings every day until to-day. We have had none now for over twenty-four hours.

April 29.—Rivas, Nicaragua. Mr. Earl Flint reports earthquake at 10:25 a. m. (?local time); duration forty-seven seconds; from northwest; very sharp after the thirtieth second.

April 30.—Rivas, Nicaragua, 11 p. m., slight shock. The earthquake of the 29th was of longer duration and greater force on Simon, west of Managua, where large trees were uprooted. The large fissures near Managua show that the direction of the shock was east and west, whereas near Rivas it was northwest and northeast. At Managua many of our large buildings were destroyed but the adobe buildings used in this community have but little power to resist an earthquake shock. As no severe shocks have occurred at Rivas for a long period, Mr. Flint concludes that there is no danger whatever of serious injury to the construction works of the Nicaragua Canal Company, and he has submitted a long report on the geology and stratification of this region in substantiation of his conclusion.

May 1.—Ontario, Cal., slight shock 1:12 a. m. Sunday morning.

May 6 *and* 29.—Rivas, Nicaragua. Mr. Earl Flint says:

In my report for April I noted the severe earthquake of April 29, which was repeated on the 6th and 29th of May. Had surmised its origin as Momotombo, as that mountain is emitting smoke and ashes. The Government Canal Commission believes the earthquake originated at Santa Clara, finding there recent fissures, and considers Momotombo, as an outlet of gases, a safety valve like Ometepe, which erupted in 1883, since when it has not failed to emit smoke and sulphurous fumes. My nephew ascended the latter some two months since and found sulphur and sal ammoniac. He was there when two of the Canal Commission ascended on the same day as the earthquake.

June 2.—Trembling at Masaya, Nicaragua.

CORRIGENDA.

REVIEW for December, 1897, Vol. XXV, p. 540, second column, line 4 from bottom, for "11,378," read "3,300;" page 541, line 5, for "1875" read "1895;" page 541, line 6, for "8", read "12;" page 542, column 1, line 7 from bottom, for "December 15" read "December 29."

MONTHLY WEATHER REVIEW, February, 1898, p. 59, second column, line 9, and also in the corresponding paragraph on pages 103 and 163: The published reduced barometer for Port au Prince, Haiti, has been corrected for instrumental error and temperature of attached thermometer and the reduction to sea level, but has not been reduced to standard gravity; it, therefore, needs an additional correction of —0.064. This remark applies to all the published data from Port au Prince, according to a statement just received from Professor Scherer on his monthly record for May, 1898. The lines of text referred to should, therefore, read as follows: "The barometric readings have been corrected by Professor Scherer for temperature and elevation, but not for gravity."

MONTHLY WEATHER REVIEW, April, page 141, column 1, line 18, should read as follows: "A stage of about 44 feet will be reached at Evansville Wednesday, and a stage of about 47 feet at Cairo by noon Wednesday, the 30th." Page 165, column 1, line 25, for "22,500" read "225,000."

METEOROLOGICAL TABLES AND CHARTS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

For text descriptive of tables and charts see page 172 of REVIEW for April, 1898.